

Introduction to Biochemistry (Lecture 1)

- Introduction
- Definition
- Scope
- Different Biochemical reactions in the body
- Syllabus discussion

References -

1. Biochemistry, U Satyanarayana, U Chkrapani, 3rd Edition, iv.
2. Textbook of Biochemistry, O P Agarwal, 11-13.

Introduction to Biochemistry (Lecture 2)

- Structure of prokaryotic cell
- Different cell organelles in prokaryotic cell
- Eukaryotic cell
- Different cell organelles in eukaryotic cell
- Structure and functions of Nucleus
- Structure and functions of Mitochondria
- Enzymes in mitochondria
- Structure and functions of Golgi bodies
- Structure and functions of Endoplasmic reticulum
- Structure and functions of ribosomes
- Structure and functions of peroxisomes
- Structure and functions of lysosomes
- cytoplasm
- Difference between eukaryotes and prokaryotes

References-

1. Biochemistry, U Satyanarayana, U Chkrapani, 3rd Edition, 3-8.
2. Textbook of Biochemistry, O P Agarwal, 1-10.

ENZYMES (Lecture 3)

- **Definition**
- **Nomenclature**
- **Classification with examples**
 1. Oxidoreductases
 2. Transferases
 3. Hydrolases
 4. Lyases
 5. Ligases
- **Structure of enzyme**
 - Holoenzyme
 - Apoenzyme
 - Coenzyme
- **References**
 1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 85-87.
 2. Fundamentals of biochemistry, A C Deb, 140-143.

ENZYMES (Lecture 4)

- **Active site- concept**
- **Silent features**
- **Co-factor-concept**
- **Co-enzyme**
 - Concept
 - Coenzymes from B complex vitamins
 - Non vitamin coenzymes
 - Nucleotide coenzyme

- **References**

1. **Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 96-97.**
2. **Fundamentals of biochemistry, A C Deb, 151-152.**

ENZYMES (Lecture 5)

- **Factors affecting enzyme activity**

1. Effect of concentration of enzyme

2. Concentration of substrate

- Michaelis-Menten equation

3. Effect of temperature

4. Effect of pH

- **References**

1. **Biochemistry, U Satyanarayana and U Chakrapani,**

Third edition, 88-90.

2. **Fundamentals of biochemistry, A C Deb, 145-147.**

ENZYMES (Lecture 6)

- **Factors affecting enzyme activity cont...**

5. Effect of product concentration

6. Effect of activators

7. Effect of time

8. Effect of light and radiation

- **References**

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 90-91.

2. Fundamentals of biochemistry, A C Deb, 147-149

ENZYMES (Lecture 7)

- **Mechanism of enzyme action**
 - **Enzymes lower activation energy**
- **Theories of enzyme-substrate complex formation**
 - I. Lock and Key model
 - II. Induced fit theory
 - III. Substrate strain theory
- **References**
 1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 98-99.
 2. Fundamentals of biochemistry, A C Deb, 160-162.

ENZYMES (Lecture 8)

- **Enzyme Inhibition**

- **Definition**

- **Reversible inhibition**

- I. Competitive inhibition

- II. Non competitive inhibition

- III. Antimetabolites

- **Irreversible inhibition**

- **Suicide inhibition**

- **Allosteric inhibition**

- **References**

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 92-95.
2. Fundamentals of biochemistry, A C Deb, 159-160.

ENZYMES (Lecture 9)

- **Applications of enzymes**

1. Enzymes as therapeutic agents
2. Enzymes as analytical reagents
3. Diagnostic applications

- **Isoenzymes**

- Concept
- LDH
- CPK
- Alkaline phosphatase

- **References**

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 106-111.
2. Fundamentals of biochemistry, A C Deb, 162-166.

Biomolecules- Carbohydrates (Lecture 10)

- **Introduction- Definition**
- **Functions**
- **Classification**
 1. Sugars and asugars
 2. Reducing sugars and non-reducing sugars
 3. Monosaccharides-concept
 4. Classification of monosaccharides
 - I. Aldoeses-Glucose, Glyceraldehyde
 - II. Ketoses- fructose, sucrose
 5. Oligosaccharides-concept
 6. Classification of oligosaccharides
 - I. Disaccharides- maltose, lactose, sucrose etc.
 - II. Trisaccharides-
 - III. Tetrasaccharides-
 7. Polysaccharides-concepts
 8. Classification of polysaccharides
 - I. Homopolysaccharides- starch, cellulose etc.
 - II. Heteropolysaccharides-mucopolysaccharides, hyaluronic acid, heparin etc.

References -

1. Biochemistry, U Satyanarayana, U Chkrapani, 3rd Edition, 9-11.
2. Fundamentals of Biochemistry, A C Deb, 47-50.

Biomolecules- Carbohydrates (Lecture 11)

- Monosaccharides-Structural aspects
- D and L isomers
- Optical activity
- Epimerism
- Enantiomerism
- Anomerism
- Structure of glucose
 1. Pyranose and furanose ring structure
 2. Structures of fructose
- Mutarotation
- Structure of fructose
- Structure of galactose
- Structure of Ribose

References-

1. Biochemistry, U Satyanarayana, U Chkrapani, 3rd Edition, 12-17.
2. Fundamentals of Biochemistry, A C Deb, 51-55.

Biomolecules- Carbohydrates (Lecture 12)

- **Disaccharides-concept**
- Reducing and non reducing disaccharides
- Maltose- Structure and properties
- Sucrose- Structure and properties
- Lactose- Structure and properties
- Inversion of sucrose

References-

1. Biochemistry, U Satyanarayana, U Chkrapani, 3rd Edition, 17-20.
2. Fundamentals of Biochemistry, A C Deb, 56-57.

Biomolecules- Carbohydrates (Lecture 13)

- **Polysaccharides**
- Introduction and classification
- **Homopolysaccharides- Definition**
- Structure and properties of starch
- Structure and properties of Dextrin
- Structure and properties of Inulin
- Structure and properties of Glycogen
- Structure and properties of cellulose
- **Heteropolysaccharides**
- Structure and properties of Mucopolysaccharides
- Structure and properties of Hyaluronic acid
- Structure and properties of Heparin

References-

1. Biochemistry, U Satyanarayana, U Chkrapani, 3rd Edition, 20-24.
2. Fundamentals of Biochemistry, A C Deb, 57-62.

METABOLISM (Lecture 14)

- Bioenergetics
- Definition
- Concept of free energy
- Concept of entropy
- Concept of enthalpy
- Concept of high energy compounds
- ATP as a energy currency of the body
- Biological oxidation
- Redox potential
- Eletron transport chain
- Role of mitochondria

References:

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 221-226.
2. Fundamentals of Biochemistry, A C Deb, 168-175.

METABOLISM OF CARBOHYDRATES (Lecture 15)

- **Digestion and absorption of carbohydrates**
 1. Digestion in mouth
 2. Digestion in stomach- no digestion
 3. Digestion in small intestine
 4. Absorption of monosaccharides
- **Introduction to metabolism**
- **Major pathways of carbohydrate metabolism**
 1. Glycolysis
 2. TCA cycle
 3. Gluconeogenesis
 4. Glycogenesis
 5. Glycogenolysis
 6. Hexose monophosphate shunt
- **Glycolysis**
 1. **Salient features**
 2. **Reactions**
 - I. Energy investment phase
 - II. Spitting phase
 - III. Energy generation phase
- **Energetic of glycolysis**

References:

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 166-169; 244-249.
2. Fundamentals of Biochemistry, A C Deb, 266-268; 288-292.

METABOLISM OF CARBOHYDRATES (Lecture 16)

- **Kreb's Cycle**
- Introduction
- History
- Location
- **Reactions**
 1. Formation of citrate
 2. Formation of isocitrate
 3. Formation of keto glutarate
 4. Conversion to succinyl Co A
 5. Formation of succinate
 6. Conversion to fumarate
 7. Formation of malate
 8. Conversion to oxaloacetate
- **Energetics of TCA cycle**

References:

1. **Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 254-258.**
2. **Fundamentals of Biochemistry, A C Deb, 294-297.**

METABOLISM OF CARBOHYDRATES (Lecture 17)

- **Gluconeogenesis**
- Introduction
- Location
- Importance
- **Reactions**
 1. Conversion of pyruvate to phosphoenolpyruvate
 2. Conversion of fructose 1,6 biphosphate to fructose-6-phosphate
 3. Conversion of glucose-6-phosphate to glucose
- Gluconeogenesis from amino acids
- Gluconeogenesis from glycerol
- Gluconeogenesis from propionate
- Gluconeogenesis from lactate

References:

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 258-262.
2. Fundamentals of Biochemistry, A C Deb, 298-303.

METABOLISM OF CARBOHYDRATES (Lecture 18)

- **Glycogen metabolism**
- Introduction and functions of glycogen
- **Glycogenesis- synthesis of glycogen**
 1. Synthesis of UDP-Glucose
 2. Requirement of primer
 3. Role of glycogen synthase
 4. Formation of branches
- **Glycogenolysis- degradation of glycogen**
 1. Action of glycogen phosphorylase
 2. Action of debranching enzyme
 3. Formation of glucose-6-phosphate and glucose
- **Regulation of Gluconeogenesis and glycogenolysis**

References:

1. **Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 263-267.**
2. **Fundamentals of Biochemistry, A C Deb, 282-288.**

METABOLISM OF CARBOHYDRATES (Lecture 19)

- **Hexose Monophosphate Shunt**
- Introduction
- Location
- **Reactions**
 1. Oxidative phase
 2. Non oxidative phase
- **Significance**
- **Importance of pentoses**
- **Importance of NADPH**

References:

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 270-274.
2. Fundamentals of Biochemistry, A C Deb, 304-307.

BIOMOLECULES- AMINO ACIDS (Lecture 20)

- **Definition**
- **Introduction of amino acids**
 1. General structure
 2. Optical activity
 - 3. Classification of amino acids**
 - I. Based on structure
 - II. Based on polarity
 - III. Nutritional classification
 - IV. Based on metabolic fate
 - 4. Physical properties**
 - I. Zwitterion formation
 - II. Isoelectric pH

References:

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 43-49.
2. Fundamentals of Biochemistry, A C Deb, 82-86.

BIOMOLECULES- AMINO ACIDS (Lecture 21)

- **Chemical reactions of Amino acids**

- A. Reactions of -COOH group**

- i. Salt formation
 - ii. Decarboxylation
 - iii. With ammonia

- B. Reactions of -NH₂ group**

- i. Salt formation
 - ii. Transamination
 - iii. Oxidative Deamination

- **Colour reactions of amino acids**

- i. Biuret reaction
 - ii. Reaction with ninhydrin
 - iii. Xanthoproteic reaction
 - iv. Millons reaction
 - v. Sakaguchi reaction
 - vi. Sulfur test

References:

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 50-51.
2. Fundamentals of Biochemistry, A C Deb, 82-86.

BIOMOLECULES-PROTEINS (Lecture 22)

- **Introduction**
- **Functions**
- **Classification of proteins**

A. Simple Proteins

1. Globular proteins

- i. Albumins
- ii. Globulins
- iii. Glutelins
- iv. Histones
- v. Prolamines
- vi. Protamines

2. Fibrous proteins

- i. Collagens
- ii. Elastins
- iii. Keratins

B. Conjugated Proteins

1. Nucleoproteins
2. Glycoproteins
3. Lipoproteins
4. Phosphoproteins
5. Chromoproteins
6. Metalloproteins

C. Derived proteins

1. Primary derived proteins
2. Secondary derived proteins

References:

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 63-65.
2. Fundamentals of Biochemistry, A C Deb, 92-94.

BIOMOLECULES-PROTEINS (Lecture 23)

- **Structure of proteins**

1. Primary structure - linear sequence of amino acids
2. Secondary structure: Spatial arrangement of protein by twisting
3. Tertiary structure: three dimensional arrangement
4. Quaternary structure: two or more polypeptide chains

- **Primary structure:**

1. Formation of peptide bond
2. Characteristics of peptide bond
3. Writing of peptide structure

- 1. Determination of primary structure**

- I. Determination of amino acid composition
- II. Degradation of protein
- III. Determination of amino acid sequence

- 2. Degradation of protein into smaller fragments**

- I. Liberation of polypeptide
- II. Number of polypeptide
- III. Breakdown of polypeptide into fragments

- 3. Determination of amino acid sequence**

- I. Sanger's method
- II. Edman's reagent
- III. Sequenator

References:

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 52-56.
2. Fundamentals of Biochemistry, A C Deb, 95-99.

BIOULES-MOLECPROTEINS (Lecture 24)

- **Secondary structure**
 1. α helix-
 2. β pleated sheets
 3. Parallel and anti-parallel β pleated sheets
- **Tertiary structure**
 1. Concept
 2. Stability
- **Quaternary structure**
 1. Concept
 2. Bonds in quaternary structure
 3. Stability
- **Properties of proteins**

References:

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 58-61.
2. Fundamentals of Biochemistry, A C Deb, 100-102.

PROTEIN METABOLISM (Lecture 25)

- **Introduction**

- **Digestion of proteins**
 1. Digestion by gastric secretion
 2. Digestion by pancreatic proteases
 3. Digestion by small intestinal enzymes

- **Absorption of amino acids and dipeptides**

- **Amino acid pool**
 1. Sources of amino acid pool
 2. Utilization of amino acids

- **General aspects of amino acid metabolism**

- **Transamination**
 1. Introduction
 2. Salient feature of transamination
 3. Mechanism

References:

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 169-172; 330-334.
2. Fundamentals of Biochemistry, A C Deb, 271-272; 392-394.

PROTEIN METABOLISM (Lecture 26)

- **Deamination**

1. Introduction

2. Oxidative Deamination

- Mechanism

- Role of glutamate dehydrogenase

3. Non oxidative Deamination

- I. Amino acid dehydratase

- II. Amino acid desulfhydrases

- III. Deamination of histidine

References:

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 334-335.

2. Fundamentals of Biochemistry, A C Deb, 394-396.

PROTEIN METABOLISM (Lecture 27)

- **Metabolism of ammonia**

- I. Formation of ammonia
- II. Transport and storage of ammonia
- III. Functions of ammonia
- IV. Disposal of ammonia
- V. Toxicity of ammonia

- **Urea cycle**

- I. Introduction
- II. Reactions
 1. Synthesis of carbamoyl phosphate
 2. Formation of citrulline
 3. Synthesis of arginosuccinate
 4. Cleavage of arginosuccinate
 5. Formation of urea
- III. Disposal of urea

References:

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 335-339.
2. Fundamentals of Biochemistry, A C Deb, 395-398.

PROTEIN METABOLISM (Lecture 28)

- **Metabolism of Glycine**

- I. Synthesis of glycine
- II. Degradation of glycine

- III. Synthesis of specialized products**

1. Formation of purine ring
2. Synthesis of glutathione
3. Synthesis of heme
4. Synthesis of creatine
5. Conjugation reactions

Metabolism of Phenylalanine and tyrosine

1. Introduction
2. Conversion of phenylalanine to tyrosine

- **Degradation of tyrosine /phenylalanine**

1. Formation of Hydroxyphenylpyruvate
2. Formation of homogentisate
3. Formation of 4-maleylacetoacetate
4. Formation of 4- fumarylacetoacetate

- **Synthesis of specialized products**

1. Synthesis of melanin
2. Synthesis of thyroid hormones
3. Biosynthesis of catecholamine

References:

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 341-350.
2. Fundamentals of Biochemistry, A C Deb, 408-410;416-418

BIOMOLECULES-LIPIDS (Lecture 29)

- **Introduction**
- **Structure**
- **Functions**
- **Classification**
 1. Simple lipids
 - i. Fats and oils
 - ii. Waxes
 2. Complex lipids
 - I. Phospholipids
 - i. Glycerophospholipids
 - ii. Sphingophospholipids
 - II. Glycolipids
 - III. Lipoproteins
 3. Derived lipids
- **Fatty acids**
- **Classification**
 1. Even and odd fatty acids
 2. Saturated and unsaturated fatty acids
 3. Essential and non essential fatty acids
- **Simple lipids**
 - Structure
 - Properties
 - Tests to check purity
 - i. Iodine number
 - ii. Saponification number
 - iii. Acid number

References

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 28-34.
2. Fundamentals of Biochemistry, A C Deb, 65-68.

BIOMOLECULES-LIPIDS (Lecture 30)

- **Compound Lipids**
- **Phospholipids**
 - Introduction
 - Classification
 - Glycerophospholipids- Phosphatidic acid, Lecithin, Cephalin etc.
 - Sphingophospholipids- Sphingomyelins
 - Functions of phospholipids
- **Glycolipids**
 - Gangliosides
 - Cerebrosides

References

1. **Biochemistry, U Satyanarayana and U Chakrapani,**
Third edition, 34-36.

BIOMOLECULES-LIPIDS (Lecture 31)

- **Compound Lipids**

- **Lipoproteins**
 - Introduction
 - Structure
 - Classification
 - Chylomicrons, VLDL, LDL and HDL etc.
 - Differentiation between different types of lipoproteins.

- **Derived proteins**
 - Introduction
 - Cholesterol
 - Structure
 - Properties and reactions
 - Functions of cholesterol

References

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 37-38.
2. Fundamentals of Biochemistry, A C Deb, 68-75.

METABOLISM OF LIPIDS (Lecture 32)

- **Digestion and absorption of lipids**
 - i. Digestion of lipids in the stomach
 - ii. Emulsification of lipids
 - iii. Digestion of lipids by pancreatic enzymes
 - iv. Degradation of triacylglycerols
 - v. Degradation of cholesteryl esters
 - vi. Degradation of phospholipids
 - vii. Absorption of lipids
 - viii. Role of bile salts
 - ix. Mechanism of lipid absorption
- **Metabolism of lipids**
 - Introduction
 - Fatty acid oxidation
 - I. Fatty acid activation
 - II. Transport
 - III. β -oxidation of fatty acids
 - IV. Energetics

References

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 173-176; 285-290.
2. Fundamentals of Biochemistry, A C Deb, 68-75; 332-335.

METABOLISM OF LIPIDS (Lecture 33)

- **KETONE BODIES**
- **Ketogenesis-Generation of ketone bodies**
 1. Formation of acetoacetyl Co A
 2. Formation of HMG CoA
 3. Cleavage of HMG Co A to produce acetoacetate and Acetyl Co A
 4. Formation of acetone and β -hydroxybutyrate
- **Utilization of Ketone bodies**
 - **Introduction**
 - **Reactions of ketone bodies**
 1. Conversion of β -hydroxybutyrate to Acetoacetate
 2. Formation of acetoacetyl Co A
 3. Formation of Acetyl Co A
- Over production of ketone bodies
- Regulation of ketogenesis
- Ketoacidosis

References

1. **Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 293-297.**

METABOLISM OF LIPIDS (Lecture 34)

Biosynthesis of cholesterol

- **Introduction**
- **Functions of cholesterol**
- **Biosynthesis steps**
 - I. Synthesis of HMG Co A
 - II. Formation of mevalonate
 - III. Production of isoprenoid subunits
 - IV. Synthesis of squalene
 - V. Formation of Lanosterol
 - VI. Formation of cholesterol
- **Regulation of cholesterol synthesis**
- **Degradation of cholesterol**
 - I. Synthesis of bile acids
 - II. Synthesis of steroid hormones
 - III. Synthesis of Vit D

References

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 309-314.
2. Fundamentals of Biochemistry, A C Deb, 361-372.

BIOMOLECULES-NUCLEIC ACIDS (Lecture 35)

- **Introduction**
- **Classification**
- **Functions**
- **Structure-**

1. Structure of nucleoside

- Nitrogen bases
 - ✓ Purines
 - ✓ pyrimidines
- sugar

2. Structure of nucleotide

- Nitrogen bases
 - ✓ Purines
 - ✓ pyrimidines
- sugar
- Phosphate group

- **References**

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 69-73.
2. Fundamentals of biochemistry, A C Deb, 105-108.

BIOMOLECULES-NUCLEIC ACIDS (Lecture 36)

- **Structure of DNA**

Watson and Crick double helical structure of DNA.

- Structure of nucleotide
- Arrangement of nucleotides in a single strand
- Arrangement of double helix
- Structure of other forms of DNA

- **Structure of RNA**

- Structure of m-RNA
- Functions of m-RNA
- Structure and functions of r-RNA
- Structure of t-RNA
- Functions of t-RNA

- **References**

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 73-82.
2. Fundamentals of biochemistry, A C Deb, 112-118.

BIOMOLECULES-NUCLEIC ACIDS (Lecture 37)

- **DNA Replication**
 - DNA replication is formation of two same copies of DNA, it involves several processes
 - Semiconservative process
 - Initiation of replication
 - Formation of replication bubble
 - Requirement of RNA primer
 - Formation of Replication fork
 - DNA synthesis by DNA polymerase
 - Nick sealing
 - Proof reading
 - Replacement of primer by DNA
 - Supercoils and DNA topoisomerase
-
- **References**
1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 523-530.

BIOMOLECULES-NUCLEIC ACIDS (Lecture 38)

- **Transcription**
- **Genetic code**
- **Characteristics of genetic code**
- **Initiation**
 - ✓ TATA Box
 - ✓ -35 sequence
- **Elongation**
 - ✓ From 5' end 3' end
 - ✓ Role of RNA polymerase
- **Termination**
 - ✓ Rho dependent termination
 - ✓ Rho independent termination
- **Post transcriptional modifications**
 - ✓ 5' Capping
 - ✓ Poly A tail
 - ✓ Intron removal
- **References**
 1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 542-548.

BIOMOLECULES-NUCLEIC ACIDS (Lecture 39)

- **Translation**

Protein synthesis takes place in following steps:

- ✓ Activation of amino acids
- ✓ Protein synthesis proper
- ✓ Post translational modifications

A) Activation of amino acids:

B) Protein synthesis proper:

1. Initiation of Translation:

- ✓ Ribosomal dissociation
- ✓ Formation of 43s preinitiation complex
- ✓ Formation of 48 s initiation complex
- ✓ Formation of 80 s initiation complex

2. Elongation:

- ✓ Binding of aminoacyl t-RNA to A-site
- ✓ Peptide bond formation
- ✓ Translocation

3. Termination:(UAA, UAG, UCA) terminates the growing polypeptide.

- **Post translational modifications:**

- ✓ Trimming by proteolytic enzymes-
- ✓ Intein splicing
- ✓ Covalent modifications

- **References**

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 550-562.

METABOLISM OF NUCLEIC ACIDS (Lecture 40)

- **Biosynthesis of purines**

Reactions of pathway for synthesis includes,

- i) Synthesis of Phosphoribosyl pyrophosphate (PRPP)
- ii) formation of 5-phosphoribosylamine
- iii) formation of glycinamide ribosyl-5-phosphate
- iv) production of formylglycinamide ribosyl-5-phosphate
- v) production of formylglycinamide ribosyl-5-phosphate
- vi) 5-amino imidazole ribosyl-5-phosphate generation
- vii) generation of aminoimidazole carboxylate ribosyl 5-phosphate
- viii) synthesis of aminoimidazole 4-succinyl carboxamide ribosyl 5-phosphate
- ix) production of aminoimidazole 4-carboxamide ribosyl 5-phosphate
- x) production of formaminoimidazole 4-carboxamide ribosyl 5-P₀4
- xi) formation of Inosine monophosphate (IMP)
- xii) conversion of IMP to Adenosine monophosphate (AMP) and (GMP)

- **Purine Catabolism**

- i. Conversion of nucleotides to nucleoside
- ii. Removal of amino group to form IMP or inosine
- iii. Inosine and guanosine are respectively converted to hypoxanthine and guanine by enzyme purine nucleoside phosphorylase
- iv. Guanine undergoes oxidation to form xanthine by guanase
- v. Conversion of hypoxanthine to xanthine by xanthine oxidase
- vi. Formation of uric acid

- **References**

- 1) Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 387-393.
- 2) Fundamentals of biochemistry, A C Deb, 443-447.

METABOLISM OF NUCLEIC ACIDS (Lecture 41)

- **Biosynthesis of pyrimidines**

Reactions of pathway for synthesis includes,

1. Formation of carbamoyl phosphate from glutamine and CO₂
2. carbamoyl phosphate condenses with aspartate to form carbamoyl aspartate
3. dehydration to form dihydroorotate
4. NAD dependent dehydrogenation to form orotate
5. Addition of Ribose-5-phosphate to form orotidine monophosphate
6. Decarboxylation to form uridine monophosphate (UMP)
7. UMP is converted to UDP by kinase which acts as a precursor for the synthesis of dUMP, dTMP, UTP and CTP.

- **References**

- 1) Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 398-400.
- 2) Fundamentals of biochemistry, A C Deb, 449-451.

VITAMINS (Lecture 42)

- **Introduction**
- **Classification**
- **Vitamin A**
 1. Introduction
 2. Chemistry and structure
 3. Absorption and transport
 4. Biochemical functions
 5. Recommended Dietary Allowance (RDA)
 6. Dietary Sources
 7. Deficiency symptoms
- **Vitamin D**
 1. Introduction
 2. Chemistry and structure
 3. Absorption and transport
 4. Biochemical functions
 5. Recommended Dietary Allowance (RDA)
 6. Dietary Sources
 7. Deficiency symptoms
- **References**
 1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 116-123.
 2. Fundamentals of biochemistry, A C Deb, 210-211.

VITAMINS (Lecture 43)

- **Vitamin E**

1. Introduction
2. Chemistry and structure
3. Absorption and transport
4. Biochemical functions
5. Recommended Dietary Allowance (RDA)
6. Dietary Sources
7. Deficiency symptoms

- **Vitamin K**

1. Introduction
2. Chemistry and structure
3. Absorption and transport
4. Biochemical functions
5. Recommended Dietary Allowance (RDA)
6. Dietary Sources
7. Deficiency symptoms

- **References**

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 123-129.
2. Fundamentals of biochemistry, A C Deb, 216-222.

VITAMINS (Lecture 73)

- **Vitamin B1**

1. Introduction
2. Chemistry and structure
3. Biochemical functions
4. Recommended Dietary Allowance (RDA)
5. Dietary Sources
6. Deficiency symptom

- **Vitamin B2**

1. Introduction
2. Chemistry and structure
3. Biochemical functions
4. Recommended Dietary Allowance (RDA)
5. Dietary Sources
6. Deficiency symptoms

- **Vitamin B6**

1. Introduction
2. Chemistry and structure
3. Biochemical functions
4. Recommended Dietary Allowance (RDA)
5. Dietary Sources
6. Deficiency symptoms

- **References**

1. Biochemistry, U Satyanarayana and U Chakrapani, Third edition, 130-131; 135-137 .
2. Fundamentals of biochemistry, A C Deb, 223-225; 228-231.

VITAMINS (Lecture 45)

- **Vitamin B12**

1. Introduction
2. Chemistry and structure
3. Biochemical functions
4. Recommended Dietary Allowance (RDA)
5. Dietary Sources
6. Deficiency symptoms

- **Vitamin C**

1. Introduction
2. Chemistry and structure
3. Biochemical functions
4. Recommended Dietary Allowance (RDA)
5. Dietary Sources
6. Deficiency symptoms

- **References**

1. Biochemistry, U Satyanarayana and U Chakrapani,
Third edition, 143-146;152-156, 132-134 .
2. Fundamentals of biochemistry, A C Deb,226-228; 235-
237; 242-245.